Speakers' Profile & Talk Abstract

From Wired to On-road Charging of Plug-in Electric Vehicles

Increasing restrictions on polluting emissions and fossil fuel consumption are driving the car makers towards the production of Electric Vehicles (EVs) and Plug-in Hybrid Electric Vehicles (PEVs) as a way of meeting the restrictions. However, proliferation of these vehicles is tightly associated to the advancements in high-energy density batteries and suitable charging equipment. After expounding the state-of-art on the traction batteries, a digression on the evolution of the charging equipment is presented. At first, topologies, characteristics and standards of the wired charging stations are reviewed. Then, battery charging equipment with wireless connection to the grid is introduced. Technologies enabling wireless power transfer (WPT) are illustrated, focusing on the inductive coupling that today is commonly used to build up the WPT battery charging emplacements. Improvement in terms of efficiency and equipment power sizing, obtained with the resonant coupling, is demonstrated. At last, the research efforts on the dynamic (or on-road) WPT (DWPT) battery charging is outlined together with the envisaged architectures for the DWPT systems and the technical solutions under development for their main parts.

Giuseppe Buja received the "laurea" degree in electronic engineering with honors from the University of Padova, Italy, where he is currently a Full Professor. He is the General Chair of the Annual Conference of the IEEE Industrial Electronics Society (IES). Also, he is an Associate Editor of IEEE Transactions of Industrial Electronics, a member of several important international scientific associations and committees, such as the Power Electronics and Motion Control Council and the Transportation Electrification Technical Committee of IEEE- IES. His research activity is substantiated by more than 200 papers published in international journals and proceedings. He was elevated to the degree of IEEE Fellow "for contributions to power electronics" and was a recipient of Dr. Eugene Mittelmann Achievement Award from IEEE-IES "in recognition of his outstanding technical contributions to the field of industrial electronics".

Electric Motor Drives and Control for Electric/Hybrid Vehicles

With ever-increasing concerns on our environment, there is a fast growing interest in electric vehicles (EVs) and hybrid EVs (HEVs) from automakers, governments, and customers. As electric motor drives are the core of both EVs and HEVs, it is a pressing need for researchers to develop advanced electric-drive systems. In this lecture, the development status of EVs/HEVs in China will be firstly introduced. The general requirement of traction motor drive for EV/HEVs is discussed. An overview of permanent-magnet (PM) brushless motor drives for EVs and HEVs is presented, with emphasis on machine topologies, drive operations, and control strategies. Then, major research directions of the permanent magnet brushless motor drive systems are elaborated, including the stator PM motor drive and fault-tolerant control, magnetic-geared outer-rotor PM motor drive, and the electric variable transmission (EVT) system.

Ming Cheng，IEEE Fellow and IET Fellow, the Distinguished Professor in the School of Electrical Engineering, Director of the Research Center for Wind Power Generation, and Associate Director of Yancheng Research Institute of New Energy Vehicles, Southeast University. From 2002 to 2009, he served as the Dean of School of Electrical Engineering, Southeast University. As a Visiting Professor, he worked in the Wisconsin Electric Machines and Power Electronics Consortium (WEMPEC), the University of Wisconsin-Madison from January to April, 2011, and in the Department of Energy Technology, Aalborg University, Denmark from June to July, 2012 and August 2015, respectively.

His research interests and experience include design and analysis of permanent magnet machines, variable speed motor drives for electric vehicles, wind power generator system and control, He has published over 400 technical papers, 5 books and 4 book chapters, and holds over 60 issued Chinese invention patents in these areas.

Development of clean energy technology

This talk will introduce the development of clean energy Denmark, especially describe the modern wind power technology with focus on electrical engineering aspect, offshore wind power. The presentation will also report the research activities in wind power research program at the department of energy technology, Aalborg University, Denmark.

Zhe Chen received the Ph.D. degree from University of Durham, U.K. with a topic of “Advance wind energy convertors using electronic power conversion”. Dr Chen has been a Professor at Department of Energy Technology, Aalborg University, Denmark since 2002. He is the leader of Wind Power System Research program at the Department of Energy Technology, Aalborg University, and the Principal Investigator of Wind Energy at Sino-Danish Center for Education and Research (SDC), which is a research and education institution organized by combined force of 8 Danish Universities. His main current research interests are wind energy and modern power systems. He has initiated and participated in many national, international and industrial cooperation projects. He has more than 400 publications in his technical field with more than 9000 citations and h-index of 43 (Google Scholar). Prof Chen has been invited to make keynote speeches at conferences/workshops, lectures presentations more than 40 times around world. He is an international expert for research project/position evaluation of a number of organizations internationally (EU, UK, Belgian, Italy, Canada, Cyprus, Estonia, Latvia and China). Dr Chen is an Associate Editor (Renewable Energy) of the IEEE Transactions on Power Electronics, a Fellow of the Institution of Engineering and Technology (London, U.K.), and a Chartered Engineer in the U.K.

Smart grid and big data analysis

Smart Grids is characterized by a class of advanced data acquisition, supervision and communication devices, as well as up-to-date information processing technologies, thus giving rise to a large amount of collected data than ever. The potential benefits of such data can be tremendous to facilitate the operation and management of the power system. More insightful information and knowledge can be obtained and utilized than ever, provided proper big data analytics in context of Smart Grids can be in place.

In this talk, a brief overview of Big Data in Smart Grids will be given. The status quo of Smart Grids development is firstly reviewed, followed by typical applications of Big Data in Smart Grids. The underpinning technologies and potential challenges facing Big Data analysis will also be discussed. Lastly, a newly developed granule-based interval forecasting technique to handle forecasting of large scale and chaotic time series of renewable power generation is discussed. Some conclusions are drawn with future scope of work at the end

Dr. Zhao. Xu received his B.Eng., B.Eng., and Ph.D. degrees from Zhejiang University, China, in 1996, National University of Singapore, Singapore, in 2002, and The University of Queensland, Australia, in 2006, respectively. He is now with The Hong Kong Polytechnic University, where he is currently Leader of Smart Grid research. He was previously with Centre for Electric Power and Energy, Technical University of Denmark. He is currently an Editor, IEEE Power Engineering Letter for IEEE PES Transactions on Power Systems, Power Delivery, Power Conversion, Smart Grids and Sustainable Energy. He is also an Editor of Electric Power Components and Systems. He is Senior Member and also serving as Deputy Chairman of IEEE PES joint Chapter, Hong Kong. His research interests include grid integration of renewable energies and EVs, electricity market planning and management, and big data and AI applications in power engineering.

Model Predictive Control Methods for Power Converters in Smart Micro Grids

For effective integration and utilization of renewable energy sources, smart micro grids have recently attracted great attentions. The Centre for Green Energy and Vehicle Innovations (CGEVI) is a research strength of the University of Technology, Sydney, Australia. Since early 1990s, the CGEVI researchers have been working in the field of electrical machines, drive systems, renewable power generation, in particular wind and photo voltaic systems, and applications. This presentation briefly reports the recent CGEVI research activities on model predictive control methods for power electronic converters and micro grids. Issues like islanded and grid connected mode operations, one step delay compensation, switching frequency reduction, and future scenarios are discussed.

Prof. J. G. Zhu received his BE in 1982 from Jiangsu Institute of Technology, China, ME in 1987 from Shanghai University of Technology, China, and Ph.D in 1995 from University of Technology, Sydney (UTS), Australia, all in electrical engineering. He currently holds the positions of Professor of Electrical Engineering and Head for School of Electrical, Mechanical and Mechatronic Systems at UTS, Australia. His research interests include electromagnetics, magnetic properties of materials, electrical machines and drives, power electronics, green energy systems and smart micro grids.

He has been a team leader and chief investigator for over 50 government and industry funded research projects, and based on his research findings, published 1 book, 3 book chapters, 268 journal articles, and 507 conference papers.

Active Distribution System Power Quality Control through Grid Interfacing Converters

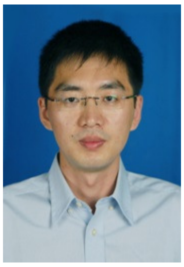
With today's increasing concerns on energy costs, energy security and greenhouse gas emissions, more and more renewable energy sources is being integrated into the power distribution system through distributed generation (DG). For example, photovoltaic (PV) power production has been doubling every two years, increasing by an average of 48% each year since 2002. At the same time, the increased penetration of nonlinear loads may introduce power quality issues to the distribution power system. Such a system with the presence of many power electronics interfaced DG and loads can be considered as an active distribution system, where the power electronics interfaces can actively participated in the system operation and control with improved efficiency, reliability and power quality. This talk focuses on the distribution system harmonic control through the microgrid or DG-grid interfacing converters. The compensation strategies are developed using the virtual impedance control concept.

Dr. Yunwei (Ryan) Li is currently a Professor with the Department of Electrical and Computer Engineering, University of Alberta, Canada. Dr. Li received the Ph.D. degree from Nanyang Technological University, Singapore. In 2005, Dr. Li was a Visiting Scholar with the Aalborg University, Denmark. From 2006 to 2007, he was a Postdoctoral Research Fellow at Ryerson University, Canada. In 2007, he also worked at Rockwell Automation Canada. His research interests include control and PWM for power converters in distributed generation, microgrid, renewable energy, electric motor drives, and custom power devices. Dr. Li has published over 120 papers in these areas.

Dr. Li is a senior member of IEEE, a Professional Engineer with Alberta Canada. He serves as an Associate Editor for IEEE Transactions on Power Electronics, IEEE Transactions on Industrial Electronics, and IEEE Journal of Emerging and Selected Topics in Power Electronics. Dr. Li received the Richard M. Bass Outstanding Young Power Electronics Engineer Award from IEEE Power Electronics Society in 2013, and the Prize Paper Award of IEEE Transactions on Power Electronics in 2014.

Grid-Friendly Power Converter Control for Wide-Spread Utilization of Renewable Distributed Generation

To deliver sustainable, economic and secure electricity supplies, more and more renewable generators are integrated into power grid. For example, Britain generated more of its electricity from renewable sources than from burning coal for the first time in the second quarter of 2015, as more wind and solar farms were built. For higher penetration of renewable distributed generation into our electricity network, grid-friendly control strategies are called on for grid converters – the power electronic interfaces for various distributed generators. Addressing this fascinating research topic, power system stability, power quality, and advanced converter control strategies (such as accurate repetitive/resonant voltage/current control, "mimic synchronous generator" control, and optimal smarter grid control) would be discussed and related in detail. This presentation will investigate the content of "grid-friendly", and will present a general framework for such a smart solution to future electricity network.

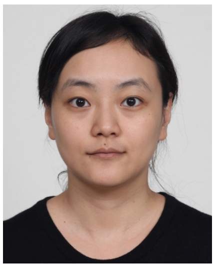


Dr. Keliang Zhou received Ph.D. degree in Electrical and Electronics Engineering from Nanyang Technological University in Singapore in 2002. In 1992 and 1995 I was conferred the B. Eng. Degree and the M. Eng. Degree by Huazhong University of Science and Technology in China and Wuhan Transportation University in China respectively.

Dr. Zhou is currently a Senior Lecturer in the School of Engineering at the University of Glasgow. He is one of pioneering researchers and active contributors in the fields of repetitive control (including extended harmonic control) of power converters, PWM techniques, and modeling and control of high frequency link converters. He has authored or coauthored over 100 published peer-reviewed technical papers and tens of patents.

Capacitive-coupling Grid-connected Inverter for Renewable Energy Integration and Power Quality Conditioning

The capacitive-coupling grid-connected inverter (CGCI) consists of a full-bridge single phase inverter coupled to a power grid via one capacitor in series with an inductor. In contrast with the conventional inductive-coupling grid-connected inverter (IGCI), the CGCI is able to transfer active power and provide lagging reactive power at an operational voltage much lower than that of the IGCI. It is a promising solution for micro-grid and building integrated distributed generator (DG) system. A quasi-PR controller is developed for the CGCI with its design method. Simulation and experiments show the effectiveness of the proposed approach.



NingYi Dai (S'05 - M' 08 – SM' 15) was born in Jiangsu, China. She received the B.Sc. degree in electrical engineering from the Southeast University, Nanjing, China, in 2001, and the M.Sc. and Ph.D. degrees in electrical and electronics engineering from the Faculty of Science and Technology, University of Macau, Macao, China, in 2004 and 2007, respectively.

She is currently an Assistant Professor in the Department of Electrical and Computer Engineering, University of Macau. She has published more than forty technical journals and conference papers. Dr. Dai was the co-recipient of the Macao Science and Technology Invention Award (Third-Class) in 2012. Her research interests include application of power electronics in power system, renewable energy integration, pulse width modulation and motor drive.